CLAIMS

What is claimed is:

1. A method of controlling a hydraulic coupling system, comprising

pressurizing a fluid in an actuator coupled to a multi-disk clutch pack to engage the clutch pack;

pumping the fluid through the clutch pack to cool the clutch pack; and

controlling a set of valves and at least one pump with a microcontroller, the control command being optionally pulse-width modulated.

2. The method of claim 1 further comprising monitoring the vehicle dynamics, the engagement of the clutch pack being based on the vehicle dynamics.

3. The method of claim 1 further comprising monitoring or estimating the pressure of the fluid in the actuator, the control algorithm being based on the monitored or estimated pressure.

4. The method of claim 1 further comprising monitoring or estimating the fluid temperature.

5. The method of claim 4 further comprising adjusting the pressure so that the fluid temperature does not exceed an upper threshold.

6. The method of claim 1 further comprising monitoring or estimating the motor temperature.

7. The method of claim 6 further comprising adjusting the motor command so that the motor temperature does not exceed an upper threshold.

8. The method of claim 1 further comprising monitoring the overall performance of the clutch pack.

9. The method of claim 8 further comprising adjusting the control algorithm to optimize the overall performance of the clutch pack.

10. The method of claim 9 further comprising diagnosing the wear of the clutch pack.

11. The method of claim 10 further comprising adjusting the control algorithm to compensate for wear of the clutch pack.

12. The method of claim 1 further comprising following a break-in strategy.

13. The method of claim 12 wherein the break-in strategy cures the surfaces of the clutch pack.

14. The method of claim 1 further comprising following a lubrication warm-up strategy.

15. The method of claim 14 wherein the lubrication warm-up strategy optimizes the cold performance of the clutch pack.

16. The method of claim 1 further comprising providing known torque output based on a given pressure, temperature and speed difference across the clutch and separator plates of the clutch pack.

17. The method of claim 1 further comprising monitoring and controlling the pump motor and the valves for faster response and electrical energy saving.

18. The method of claim 1 further comprising monitoring the clutch engagement time, applied pressure, and temperature to control the valves for energy dissipation calculations and compensation.

19. The method of claim 1 further comprising monitoring temperature, clutch engagement time, applied pressure, and pump actuation to control the valves for temperature compensation.

20. The method of claim 1 further comprising estimating applied pressure from temperature, pulse width modulated signals associated with the valve and pump, and time.